XL Insurance

Environmental risk bulletin

Preventing Fires in the Waste Management Industry - Lithium Batteries, Hot Loads & Vehicle Fires

Material recycling facilities, transfer stations, and waste collection vehicles always have the threat of fire present. According to data presented in a 2023 National Waste & Recycling Association webinar, the industry experienced 302 reported facility fires in the U.S. and Canada in a recent 12 month span. There were twenty injuries and four deaths directly or indirectly attributed to these events. This represented a significant upswing from prior years and continues to be a serious threat to the industry as well as the general public. These incidents can result in costly insurance claims associated with catastrophic property damage, vehicle fires, worker injuries, and related litigation.

Prevention and education are key whether it relates to customers, waste management facility operators, or waste transportation personnel. Customer educational campaigns via multiple media sources can be helpful in addressing recycling guidlines, hazardous waste disposal, prohibited items, and fire hazards. Facility operators and drivers should be trained to spot potential combustion sources in the waste stream. These can include hot ashes/charcoal, volatile organic materials (i.e., paints, solvents, oils), reactive chemicals (pool treatment), batteries, and other prohibited items. These hazardous materials are often the cause of solid waste fires.

Lithium Batteries

Lithium batteries, particularly lithium-ion batteries, have become a particular ignition source problem for the waste management industry. According to a recent US Environmental Protection Agency research paper, lithium battery fires are happening across the spectrum of the waste management process, with material recycling facilities experiencing the most negative impacts. Lithium batteries are increasingly being used in many applications to replace lead acid batteries, which have a lower inherent fire risk. Lithium batteries come in many forms and are lighter weight, while being able to hold larger energy charges over longer time periods. Traditional lithium batteries, despite having a long shelf life and being relatively cheap, cannot be recharged. This limitation resulted in the production of lithium-ion batteries, which are unfortunately more prone to fires and explosions.

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Lithium-ion batteries have the potential for thermal runaway if short-circuited or exposed to high temperatures. Battery fires can start simply from the jostling of a discarded electronic device, and the resultant fire can be difficult to detect in its early stage. Lithium batteries can explode and cause fires when crushed, so it is important to segregate and eliminate them from solid waste disposal streams and lead battery recycling streams. Further, lithium batteries and lithium-ion batteries should be segregated at recycling plants because extinguishing techniques are difficult and not compatible.

To help reduce battery fires, proactive waste management companies, segregate batteries, employ advanced fire mitigation technologies at their facilities, enforce strict fire safety procedures, and collaborate with experts to continually improve their fire prevention strategies. Even with these measures, consumers and waste generators are the first line of defense in preventing battery fires. Waste management firms should be instructing customers to stop placing batteries in the trash or recycling bins, and instead dispose of them properly at their local hazardous waste drop-off site.

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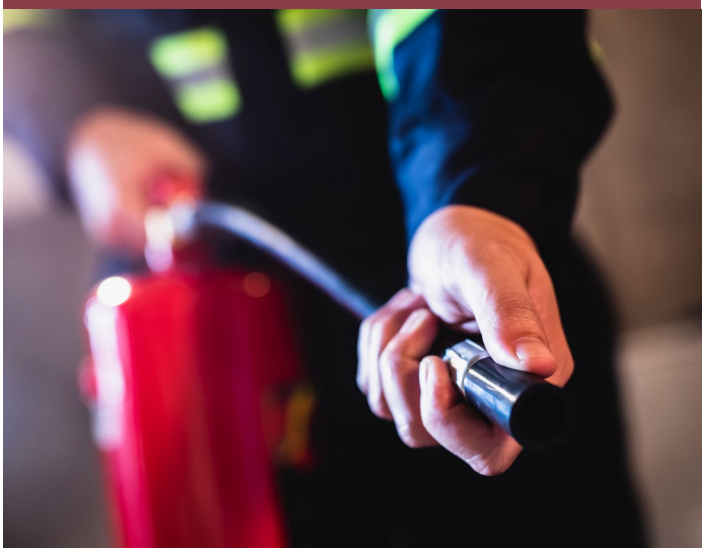

Trade organizations are also working to gain better insight into controlling waste facility fires caused by disposed batteries. The Environmental Research & Education Foundation is currently collecting data on the frequency and cause of these fires; however, there is not yet enough information on overall fire causation and batteries as a root cause. Several US states are also collecting more data on waste and recycling facility fires, which in turn could help shape policy and investments towards better fire prevention methods and stricter legislation going forward.

Facility Fire Prevention

Preventing fires at waste management facilities can be challenging given the large amounts of combustible waste products handled every day. This is compounded by the ability of these materials to slowly burn undetected until they grow into large and exceedingly difficult fires to extinguish. Prevention begins by conducting site assessments of the facilities to review the storage of potential fuel sources such as bales of paper, stacks of cardboard, recyclable plastics, and many others. Permits and codes in some jurisdictions aim to reduce the fire load by requiring tipping floors and other disposal/storage areas to be cleared within a 24-hour period, operate misting systems, and/or utilize other means of controlling dangerous dust levels from accumulating.

Electrical motors, wiring, and even mobile equipment at facilities can become ignition sources and as such should be inspected for potential “hot spots” and other maintenance problems. Fire alarm and suppression systems at facilities should also be inspected and maintained regularly to ensure that they are fully functional should the need arise.

Special care should be taken when maintenance personnel or others are engaged in operations that can generate sparks or open flames such as when cutting, grinding, and welding. Hot work permit programs can be implemented as a best management practice when conducting such activities. Even if a formal program is not in place, a fire watch should always be maintained to ensure that proper precautions are being taken when hot work is performed, especially around stored materials or wastes.

Vehicle Fires

Vehicle fires can quickly burn up a company’s profits. Although they occur less frequently than other types of transportation accidents, vehicle fires tend to be more costly in terms of property loss, as well as potentially life threatening to the driver and others. It is therefore important to understand why these fires occur and what can be done to prevent them, or at the very least limit their damage.

The precise cause of a vehicle fire can often be difficult or sometimes impossible to determine with certainty. When vehicle fires occur, they are often severe, leaving only the charred remains to be examined as evidence. Suffice to say, firefighters face unique challenges in extinguishing burning trash inside collection vehicles. Getting water into the truck body in many cases can be challenging and dangerous, which often leads to a total vehicle loss.

Vehicle fires can be caused from external ignition sources encountered while parked in a garage or an overnight parking lot. However, most vehicle fires are from a mechanical or electrical ignition source within the vehicle’s operating systems or from a “hot load.” In the trucking industry, the term “hot load” has often been associated with time-sensitive freight, but herein refers to a product or waste smoldering, spontaneously combusting, or catching fire during transport or while parked. Studies of truck

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ignition sources reportedly indicate that hot load fires account for approximately 25 percent of waste vehicle fires and present the greatest loss when trucks or transfer trailers are left loaded overnight.

Vehicle Fire Prevention

In terms of other ignition sources, studies point to electrical system problems accounting for almost half of all waste management vehicle fires. Although electrical fires can also occur on standard tractors and roll-off trucks, the vehicles most susceptible to electrical fires were found to be front loaders, rear loaders, side loaders and recycling trucks. Using battery-disconnect switches, as well as the routine inspection and proper maintenance of electrical cables, are key measures in reducing the likelihood of electrical fires on vehicles.

The remaining 25 percent of vehicle fires were found to be caused by a variety of factors, including from hydraulic leaks, frozen wheel bearings, tire fires, or holes in the exhaust system. Additionally, engine compartment fires often were related to fuel or oil leaks caused by trash or debris entering the engine compartment. Incidences of engine compartment fires, fluid leak fires, and tire and wheel bearing fires can be reduced by proper maintenance procedures and routine inspection of hydraulic hoses, fuel lines, and the exhaust system. Also, because these types of fires mostly occur while the vehicles are in use, prompt action by the driver may be able to save the truck from becoming a total loss. The importance of conducting complete daily pre-trip vehicle inspections to detect these types of deficiencies cannot be understated.

Hot Load Fire Response

In the event of a hot load while on the road, time is of the essence and drivers must be trained so they understand how to respond. Paramount are life safety considerations and minimizing vehicle and surrounding property damage. When a driver first notices their load is smoking or burning, they should immediately contact their dispatcher and call 9-1-1 for assistance. In some scenarios, it may be too late to exercise any additional response actions. Repositioning the vehicle in a safer area (if possible), moving away from the vehicle, and waiting for the fire department may be the most appropriate actions. If the vehicle fire source has originated elsewhere, drivers should be trained to utilize hand-held fire extinguishers to extinguish incipient fires.

Many municipal waste collection companies instruct drivers to compact and then eject the burning material to limit the damage to the vehicle and give firefighters a better opportunity to effectively put out the fire. If it can be safely accomplished, the driver should quickly identify an isolated area where the waste contents can be unloaded. If possible, it is a best practice not to unload a smoldering load until the fire company has arrived on scene to help extinguish the source.

Prior to unloading, the driver should check for and avoid overhead wires and other safety concerns in the surrounding area. The drop zone should be paved if possible and away from buildings, open fields, and other areas that could become engulfed if the fire were to spread. It is prudent for dispatchers and emergency plans to proactively identify safe, strategic drop zone locations along waste collection & transfer routes.

To reduce the risk of waste vehicle fires, fleet managers, maintenance staff, and drivers should take the following precautions:

- **Ensure that battery disconnect switches are installed on all collection vehicles. Establish a written policy regarding the mandatory use of these switches when the units are not in use. Periodically spot-check vehicles to verify that drivers are using the battery disconnect switches.**
- **Conduct and document inspections of battery cables, including checking for frayed cables, missing cable tie-downs, missing through-hole grommets, and buildup of grease and debris.**
- **Conduct regular inspections of the fuel lines, crank cases, hydraulic hoses, and exhaust systems. All leaks should be repaired, and any leakage cleaned and properly disposed.**
- **Establish written guidance with driver procedures for handling hot loads and other vehicle fires. Also, make sure drivers keep vehicles clean, especially behind the blades of heavy equipment.**
- **Conduct safety meetings for drivers and establish training for new drivers to ensure they are familiar with company policies concerning vehicle fires.**
- **Frequently remind drivers of the importance of preventing vehicle fires and how to deal with them. This can be accomplished with bulletin board messages, handouts, and reminders during regular driver safety meetings.**
- **Avoid leaving waste trucks and transfer trailers loaded overnight.**

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Unfortunately dropping a burning load in the wrong area can lead to a catastrophic outcome, as was the case with the 2019 Calimesa, CA wildfire. In this case, the driver discharged a hot load onto an area that was experiencing high Santa Anna winds and extreme drought conditions. The hot embers from the fire caused the burning of over 823 acres, destroyed 76 structures in a nearby mobile home park, forced the evacuation of hundreds of local residents, and resulted in the tragic death of two elderly victims.

Conclusion

There must be a concerted effort on the part of waste management companies to reduce their fire risks as much as possible throughout the waste collection and processing cycle. Fire peril results in some of the most severe insurance claim scenarios in terms of property damage, vehicle losses, and employee and public safety. These events can lead to business interruption, additional operating expense, and unsatisfied customers.

As Benjamin Franklin wrote in 1735, "An ounce of prevention is worth a pound of cure."

Fire prevention can be accomplished through the control of combustible materials at facilities, the limiting of sources of ignition including hot work, conducting routine vehicle inspections and maintenance, and providing focused and ongoing employee training – both fire prevention and response. Technological advances such as the use of heat and smoke detectors, remotely operated fire suppression systems, and other innovative solutions should be considered where the threat of fire is most present.

Lithium-ion batteries are now commonly used throughout the world and have resulted in an increased risk to the waste management industry. They present the potential for thermal runaway reactions, fire, and explosion if short-circuited, crushed, or exposed to high temperatures. Careful segregation, storage, and processing is needed to minimize these exposures.

Hot loads during transport, on the tipping floor or the landfill face can result in catastrophic consequences. In the event a hot load is detected while in transit, employees should be trained on how to properly respond in a manner that minimizes the severity of loss to their business, while protecting themselves and the general public. Immediately contacting the fire department, compacting the load, and finding a safe place with controlled conditions to eject the load are generally accepted practices. A written procedure that can be routinely reviewed with drivers should be considered a best management practice and will be useful in training efforts.
Waste management firms also need to undertake formal customer education efforts to drive buy-in on proper disposal practices. This can help minimize disposal of lithium-ion batteries, prohibited hazardous materials, hot ashes, and other potential combustion sources in the municipal waste stream. As Benjamin Franklin wrote in his letter titled "Protection of Towns from Fire" in the Pennsylvania Gazette in 1735, "An ounce of prevention is worth a pound of cure."

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